

SOUTHWEST POWER POOL (“SPP”) UPDATE

**DANA MURPHY
COMMISSIONER**

OKLAHOMA CORPORATION COMMISSION

APRIL 9, 2019





HELPING OUR MEMBERS WORK TOGETHER
TO KEEP THE LIGHTS ON... TODAY AND IN THE FUTURE.

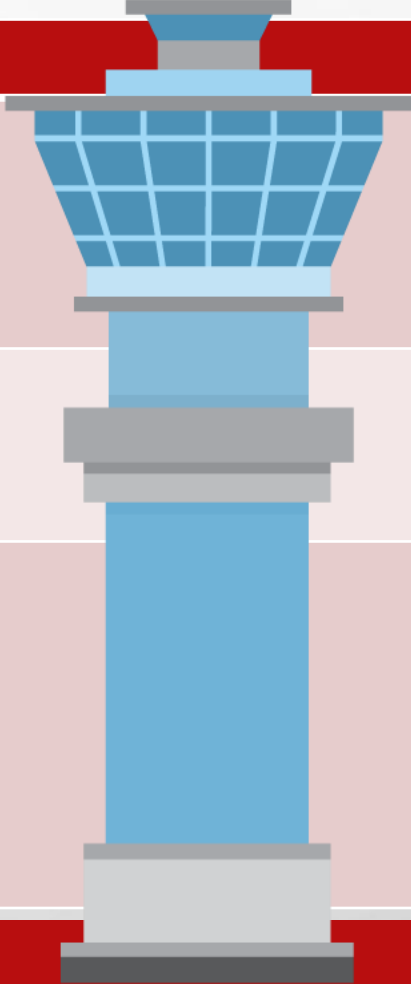
AGENDA

- **Oklahoma Corporation Commission (“OCC”)**
 - **SPP Overview**
 - **Oklahoma Presence**
 - **OCC Participation**
- **Public Service Company of Oklahoma (“PSO”)**
- **Oklahoma Gas & Electric (“OGE”)**

SOUTHWEST POWER POOL (“SPP”) 101

- **The SPP was established in 1941 when 11 utilities pooled electricity to power the Jones Mill aluminum plant, which was needed for WWII critical defense purposes**
- **SPP was maintained after WWII to continue benefits of regional coordination**
- **SPP Corporate Office located in Little Rock, AR**
- **Approx. 600 employees w/jobs in IT, electrical engineering, operations, legal, regulatory, settlements, and more**
- **24x7 operation w/full redundancy and a backup site**

AIR TRAFFIC CONTROL: AN ANALOGY

Air Traffic Control		Southwest Power Pool
does not own the airplanes, airlines or airports		does not own the utilities, power generators or transmission lines
does not own the sky that it monitors		Does not own the land the electricity flows across
directs air routes to ensure airplanes and passengers are safely transported from one destination to the next		Monitors and directs the bulk power grid in our region to ensure electricity gets from where it's made to where it's needed

REGULATORY ENVIRONMENT



- **Incorporated in Arkansas as 501(c)(6) non profit corporation**
- **Federal Energy Regulatory Commission (FERC)**
 - **Regulated public utility**
 - **Regional Transmission Organization (RTO)**
- **Founding member of the North American Electric Reliability Corporation (NERC)**

SPP TIMELINE & MILESTONES

- **1998: Implemented tariff administration**
- **2004: Became FERC-approved Regional Transmission Organization (“RTO”)**
- **2007: Launched Energy Imbalance Service (“EIS”) market**
- **2009: Integrated Nebraska Utilities (NPPD, OPPD, LES)**
- **2010: FERC approved Highway/Byway cost allocation methodology and Integrated Transmission Planning (“ITP”) Process**

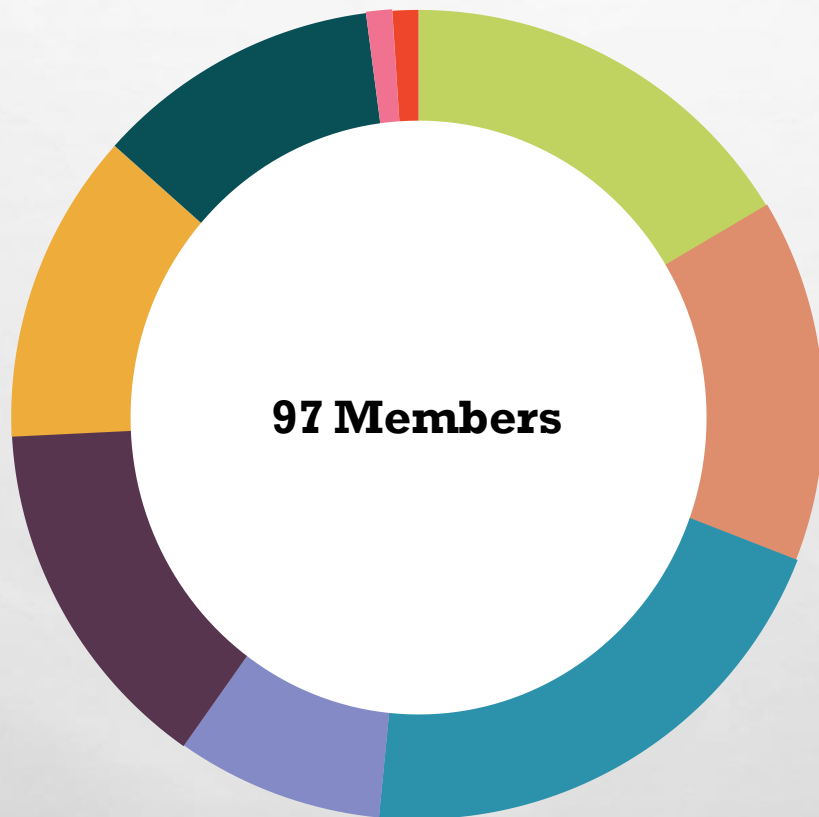
SPP TIMELINE & MILESTONES

- **2012: Moved to new Corporate Center**
- **2014: Launched Integrated Marketplace (“IM”) which replaced the EIS market and became the Balancing Authority for the footprint**
- **2015: Integrated System (“IS”) joins SPP: consists of utilities in the following states: IA, MN, MT, ND, SD, & WY**

OKLAHOMA STATUTES AND RULES GOVERNING SPP PARTICIPATION

- **SENATE BILL NO. 827: 2009 LEGISLATIVE SESSION**
 - **PROMOTE DEVELOPMENT OF TRANSMISSION INFRASTRUCTURE TO SUPPORT EXPANSION OF WIND ENERGY FACILITIES, AUTHORIZES EMPLOYMENT OF ONE PERSON TO ADVISE THE OCC, AND SHALL ATTEND AND PARTICIPATE IN MEETINGS OF THE SPP**
- **TITLE 17 CHAPTER 13A SECTION 287 - LEGISLATIVE DECLARATION - PROMOTION OF WIND-ENERGY DEVELOPMENT-PLAN TO EXPAND TRANSMISSION CAPACITY IN STATE: 2010 LEGISLATIVE SESSION**
 - **A. DEVELOP ROBUST TRANSMISSION GRID TO FACILITATE DELIVERY OF RENEWABLE ENERGY, IMPROVE RELIABILITY OF THE GRID, PROMOTE WIND ENERGY TO BE UTILIZED IN EVERY PART OF THE STATE AND EXPORTED TO OTHER STATES**
 - **B. WORK WITH SPP TO DEVELOP TRANSMISSION EXPANSION PLAN WITH FINAL REPORT DUE JANUARY 1, 2020**

SPP'S 97 MEMBERS: INDEPENDENCE THROUGH DIVERSITY



- 16 Investor-Owned Utilities
- 14 Municipal Systems
- 20 Generation and Transmission Cooperatives
- 8 State Agencies
- 14 Independent Power Producers
- 12 Power Marketers
- 11 Independent Transmission Companies
- 1 Federal Agency
- 1 Large Retail Customer

SPP MEMBER BREAKDOWN

Transmission Owner (“TO”)/Transmission User (“TU”)

- **TOs w/more than 500 miles of transmission: 18**
- **TOs w/less than 500 miles of transmission: 27**
- **TU: 52**
- **Total Members: 97**

OKLAHOMA SPP MEMBERS: TOS w/MORE THAN 500 MILES OF TRANSMISSION

- **OKLAHOMA GAS & ELECTRIC: INVESTOR-OWNED UTILITY**
- **PUBLIC SERVICE COMPANY OF OKLAHOMA: INVESTOR-OWNED UTILITY**
- **EMPIRE DISTRICT ELECTRIC: INVESTOR-OWNED UTILITY**
- **WESTERN FARMERS ELECTRIC COOPERATIVE: COOPERATIVE**
- **GRAND RIVER DAM AUTHORITY: STATE AGENCY**

OKLAHOMA SPP MEMBERS: TOs w/LESS THAN 500 MILES OF TRANSMISSION

- **OKLAHOMA MUNICIPAL POWER AUTHORITY (“OMPA”): MUNICIPAL**
- **AEP OKLAHOMA TRANSMISSION COMPANY: INVESTOR-OWNED UTILITY**
- **ITC—GREAT PLAINS: INDEPENDENT TRANSMISSION COMPANY**
- **GRIDLIANCE HIGH PLAINS: INDEPENDENT TRANSMISSION COMPANY**

OKLAHOMA SPP MEMBERS: TUs

- **CPV RENEWABLE ENERGY COMPANY: INDEPENDENT POWER PRODUCER**
- **EDP RENEWABLES NORTH AMERICA: INDEPENDENT POWER PRODUCER**
- **ENEL GREEN POWER NORTH AMERICA: INDEPENDENT POWER PRODUCER**
- **NEXTERA ENERGY RESOURCES: INDEPENDENT POWER PRODUCER**
- **NEXTERA ENERGY TRANSMISSION: INDEPENDENT TRANSMISSION COMPANY**

OKLAHOMA SPP MEMBERS: TUs

- **OGE TRANSMISSION: INVESTOR-OWNED UTILITY**
- **PLAINS AND EASTERN CLEAN LINE: INDEPENDENT TRANSMISSION COMPANY**
- **TRI-COUNTY ELECTRIC COOPERATIVE: COOPERATIVE**
- **WALMART INC.: LARGE RETAIL CUSTOMER**

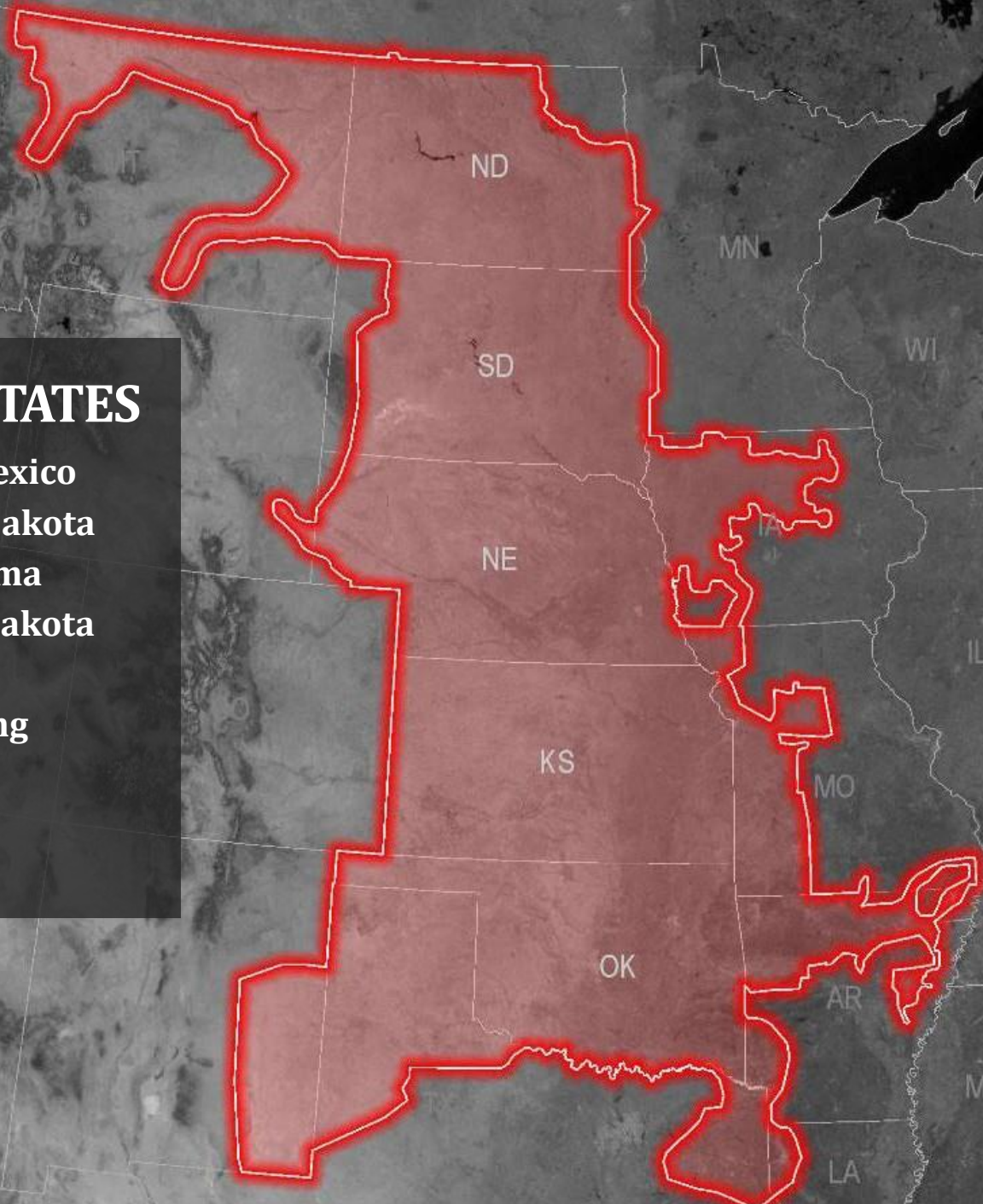
OKLAHOMA LOAD SERVING ENTITIES ("LSE") AND THEIR REGIONAL LOAD RATIO SHARE ("LRS")

- **OKLAHOMA GAS & ELECTRIC:** **12.23%**
- **PUBLIC SERVICE COMPANY OF OKLAHOMA:** **7.67%**
- **WESTERN FARMERS ELECTRIC COOPERATIVE:** **3.30%**
- **GRAND RIVER DAM AUTHORITY:** **2.00%**
- **OKLAHOMA MUNICIPAL POWER AUTHORITY:** **1.20%**
- **TRI-COUNTY ELECTRIC COOPERATIVE:** **0.30%**
- **EMPIRE DISTRICT ("OK CUSTOMERS"):** **0.0675%**
- **TOTAL OK REGIONAL LRS:** **26.77%**

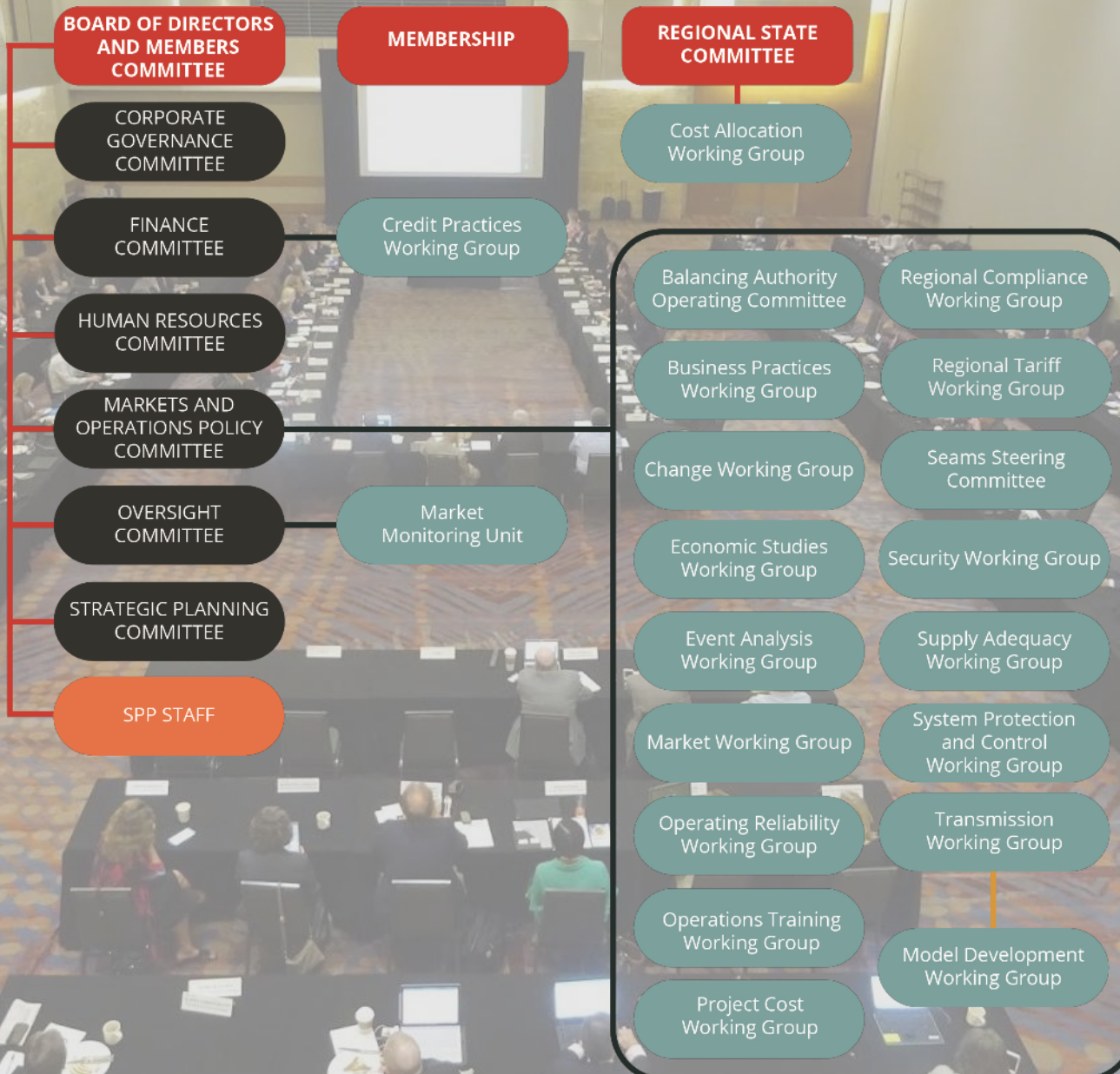


MEMBERS IN 14 STATES

- Arkansas
- Kansas
- Iowa
- Louisiana
- Minnesota
- Missouri
- Montana
- Nebraska
- New Mexico
- North Dakota
- Oklahoma
- South Dakota
- Texas
- Wyoming



FACILITATION



BOARD OF DIRECTORS



**Larry
Altenbaumer,
Chairman**



**T. Graham
Edwards, Vice
Chairman**



**Nicholas A.
(Nick) Brown,
President and
CEO**



**Phyllis E.
Bernard**



Julian Brix



Susan Certoma



Mark Crisson



**James E. (Jim)
Eckelberger,
Emeritus**



**Joshua W.
Martin, III**



Darcy Ortiz



Bruce A. Scherr



**Harry Skilton,
Emeritus**

REGIONAL STATE COMMITTEE

		Kim O'Guinn, RSC President Arkansas Public Service Commission		Dennis Grennan, RSC Vice President Nebraska Power Review Board		Kristie Fiegen, RSC Secretary/ Treasurer South Dakota Public Utilities Commission	
	Shari Feist Albrecht Kansas Corporation Commission		Foster Campbell Louisiana Public Service Commission		Randel Christmann North Dakota Public Service Commission		Geri Huser Iowa Utilities Board
		Dana Murphy Oklahoma Corporation Commission		Scott Rupp Missouri Public Service Commission		DeAnn T. Walker Public Utility Commission of Texas	

STATE REGULATORS' ROLE

- Regional State Committee — Retail regulatory commissioners from:

Arkansas	Missouri	Oklahoma
Iowa	Nebraska	South Dakota
Kansas	New Mexico	Texas
Louisiana	North Dakota	

- Membership: Open to all government entities that:
 - Regulate retail electricity or distribution rates of SPP Members; or
 - Primary regulatory agency responsible for siting electric transmission facilities of SPP Members

STATE REGULATORS' ROLE

- Primary responsibility for:
 - Cost allocation for transmission upgrades
 - Approach for regional resource adequacy
 - Allocation of transmission rights in SPP's markets

OKLAHOMA CORPORATION COMMISSION INVOLVEMENT AND PARTICIPATION IN SPP

- **COMMISSIONER DANA L. MURPHY: OKLAHOMA RSC MEMBER AND SENIOR RSC MEMBER – 2011**
- **BRANDY WREATH: DIRECTOR OF THE PUBLIC UTILITY DIVISION**
 - **JASON CHAPLIN: OKLAHOMA COST ALLOCATION WORKING GROUP (“CAWG”) MEMBER**
 - **MARYDORIS CASEY: FUEL ADJUSTMENT CLAUSE MONTHLY & ANNUAL INTEGRATED MARKETPLACE ACTIVITY AND ANNUAL SPP COST TRACKER RE-DETERMINATIONS**
 - **COMMITTEE & WORKING GROUP COVERAGE: FC, SPC, MOPC, CAWG, PCWG, SAWG, TWG, ESWG, RTWG, RARTF, MWG, CWG, SUG**

RSC TIMELINE & MILESTONES

- **FEB. 10, 2004: SPP APPROVED AS AN RTO**
- **APRIL 26, 2004: RSC ADOPTS SPP RSC BYLAWS**
- **OCT. 2004: RSC APPROVES BASE PLAN FUNDING COST ALLOCATION**
- **JAN. 2007: RSC APPROVES ATTACHMENT Z CREDITING PROCESS**
- **JAN. 2008: RSC APPROVES BALANCED PORTFOLIO COST ALLOCATION**
- **APRIL 2009: RSC APPROVES INTEGRATED TRANSMISSION PLANNING (“ITP”)**

RSC TIMELINE & MILESTONES

- **JUNE 2009: RSC APPROVES WIND COST ALLOCATION**
- **OCT. 2009: RSC APPROVES HIGHWAY/BYWAY COST ALLOCATION**
- **OCT. 2010: RSC APPROVES COST ALLOCATION WORKING GROUP'S ("CAWG") TRANSMISSION CONGESTION RIGHTS ("TCR") RECOMMENDATION**
- **APRIL 2012: RSC DENIES PROPOSED HUB AND SPOKE WIND PROJECT**
- **OCT. 2012: RSC APPROVES ORDER 1000 INTERREGIONAL COST ALLOCATION**

RSC TIMELINE & MILESTONES

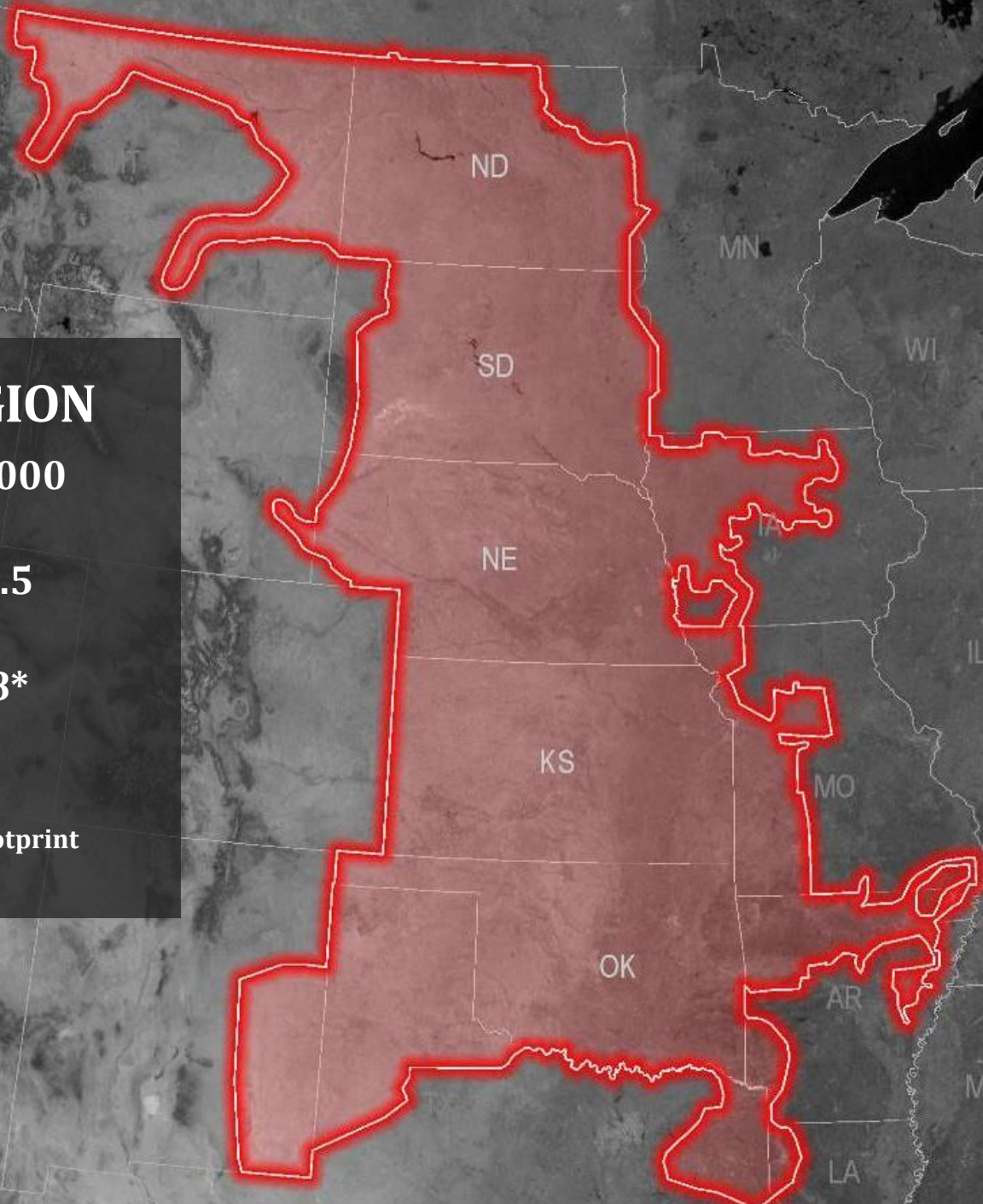
- **APRIL 2014: RSC APPROVES GUIDELINES FOR PROVIDING LONG-TERM TCRS**
- **OCT. 2014: RSC APPROVES NON-ORDER 1000 COST ALLOCATION**
- **OCT. 2016: RSC APPROVES NEW MEMBER COST ALLOCATION REVIEW PROCESS**
- **JAN. 2017: RSC APPROVES RESOURCE ADEQUACY REQUIREMENT**
- **APRIL 2017: RSC APPROVES SPP/AECI INTERREGIONAL PROJECT**

SPP FAST FACTS

OPERATING REGION

- **Service territory: 546,000 square miles**
- **Population served: 17.5 million**
- **Generating plants: 818***
- **Substations: 5,054***

***In SPP's reliability coordination footprint**



EHV Transmission

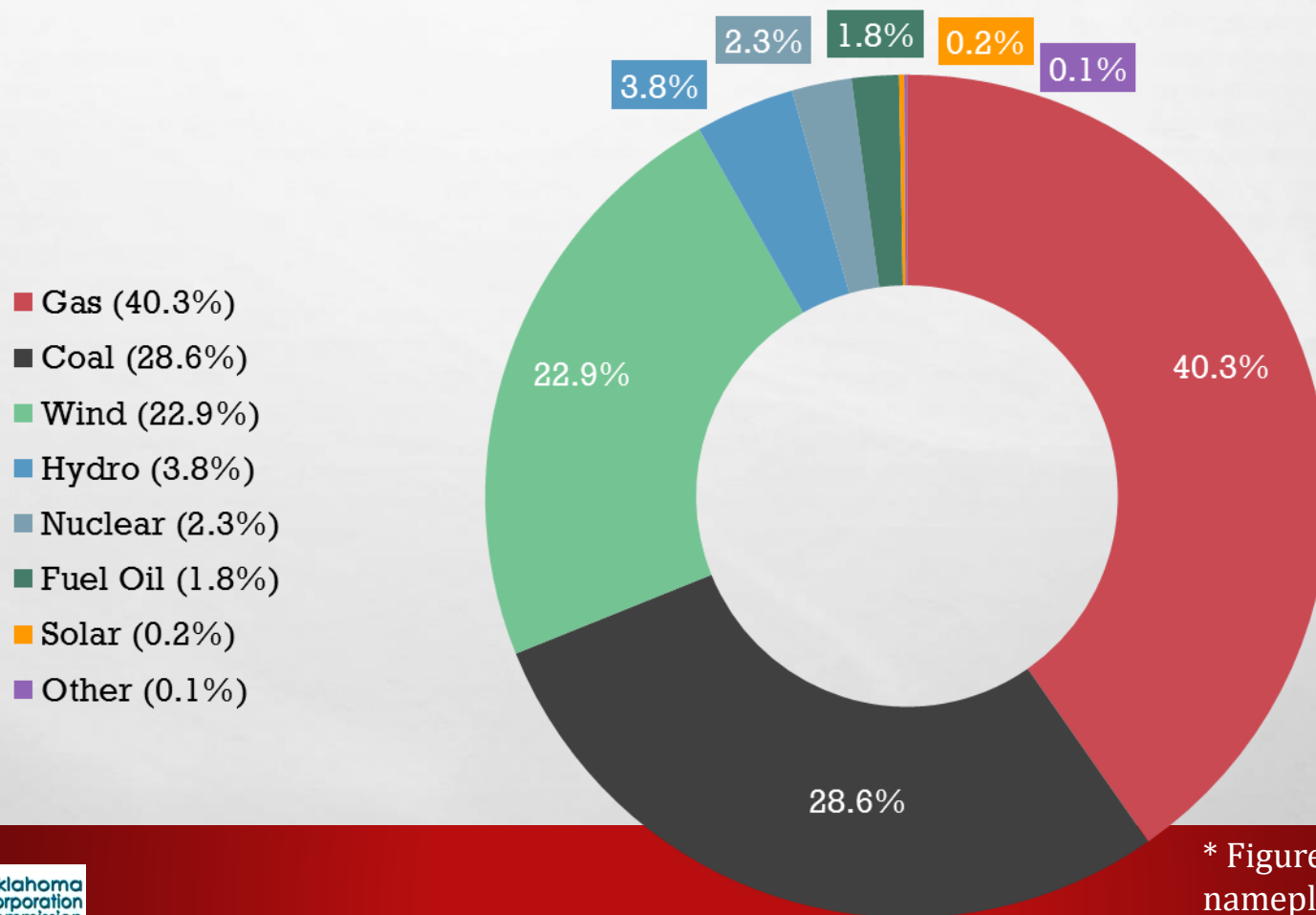
- 230 kV
- 345 kV
- 500 kV



• Miles of transmission: 66,892

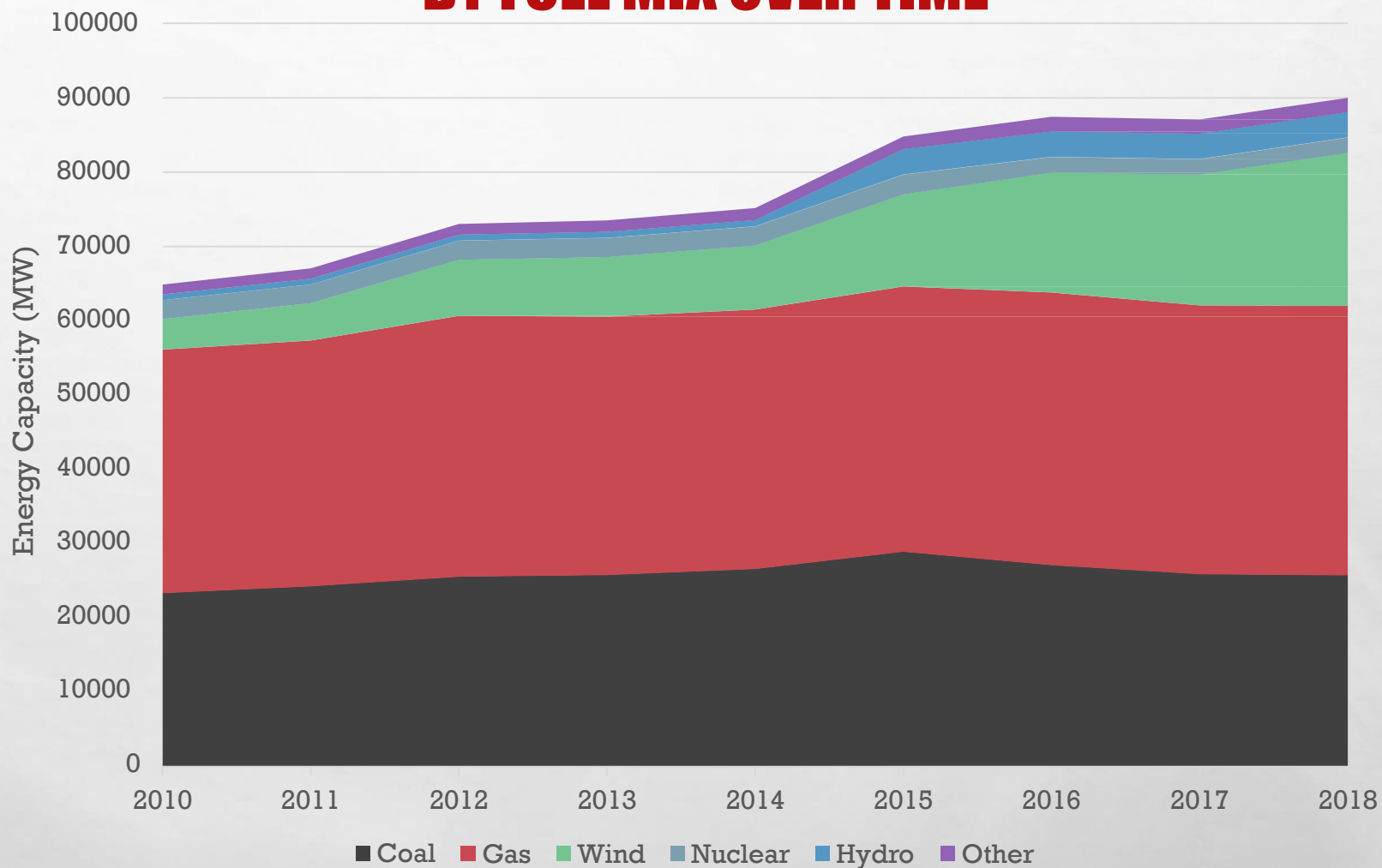
• 69 kV	17,340
• 115 kV	15,846
• 138 kV	9,367
• 161 kV	5,567
• 230 kV	7,534
• 345 kV	11,146
• 500 kV	92

GENERATING CAPACITY* BY FUEL TYPE (89,999 MW TOTAL)

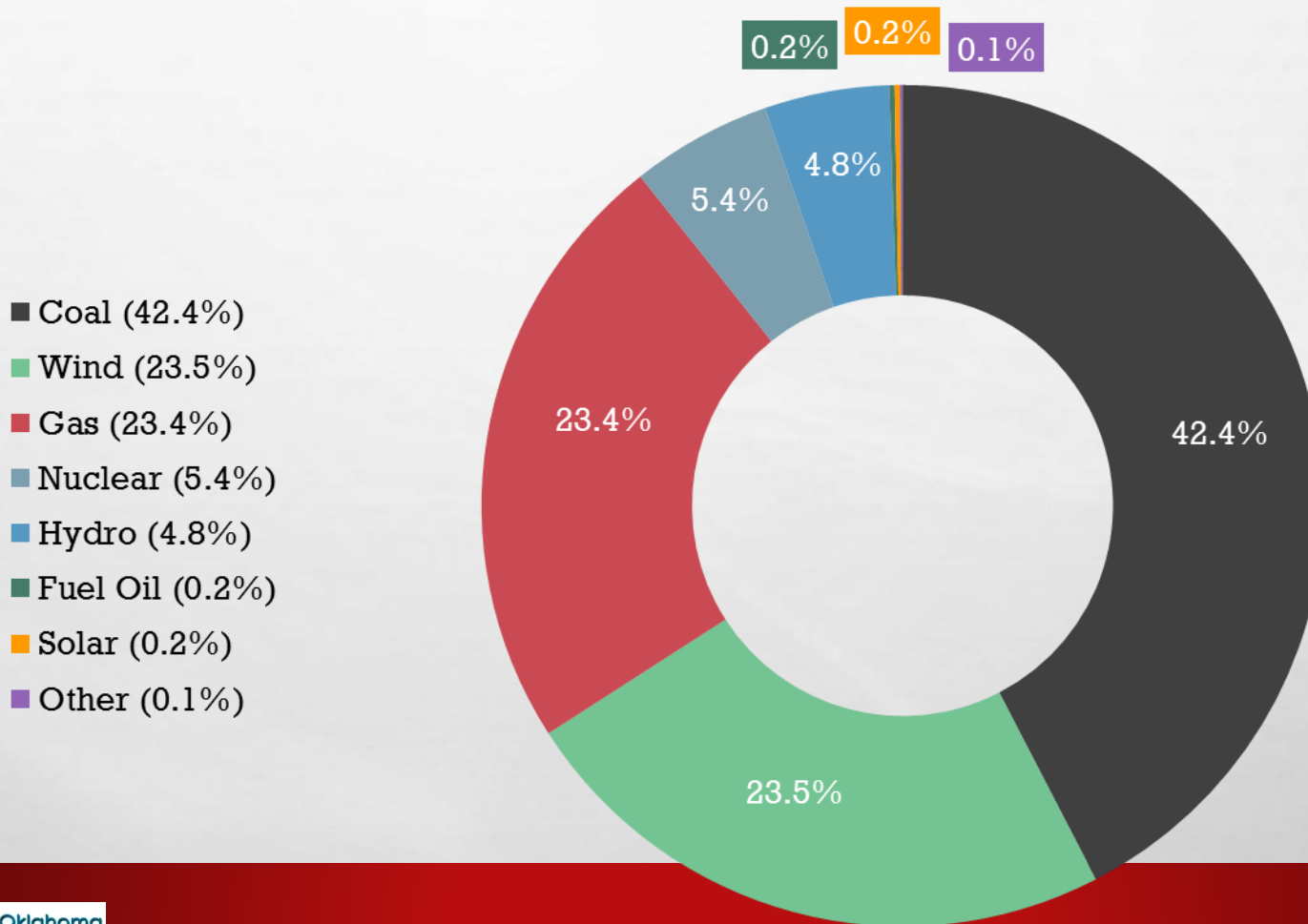


* Figures refer to nameplate capacity as of 1/1/19

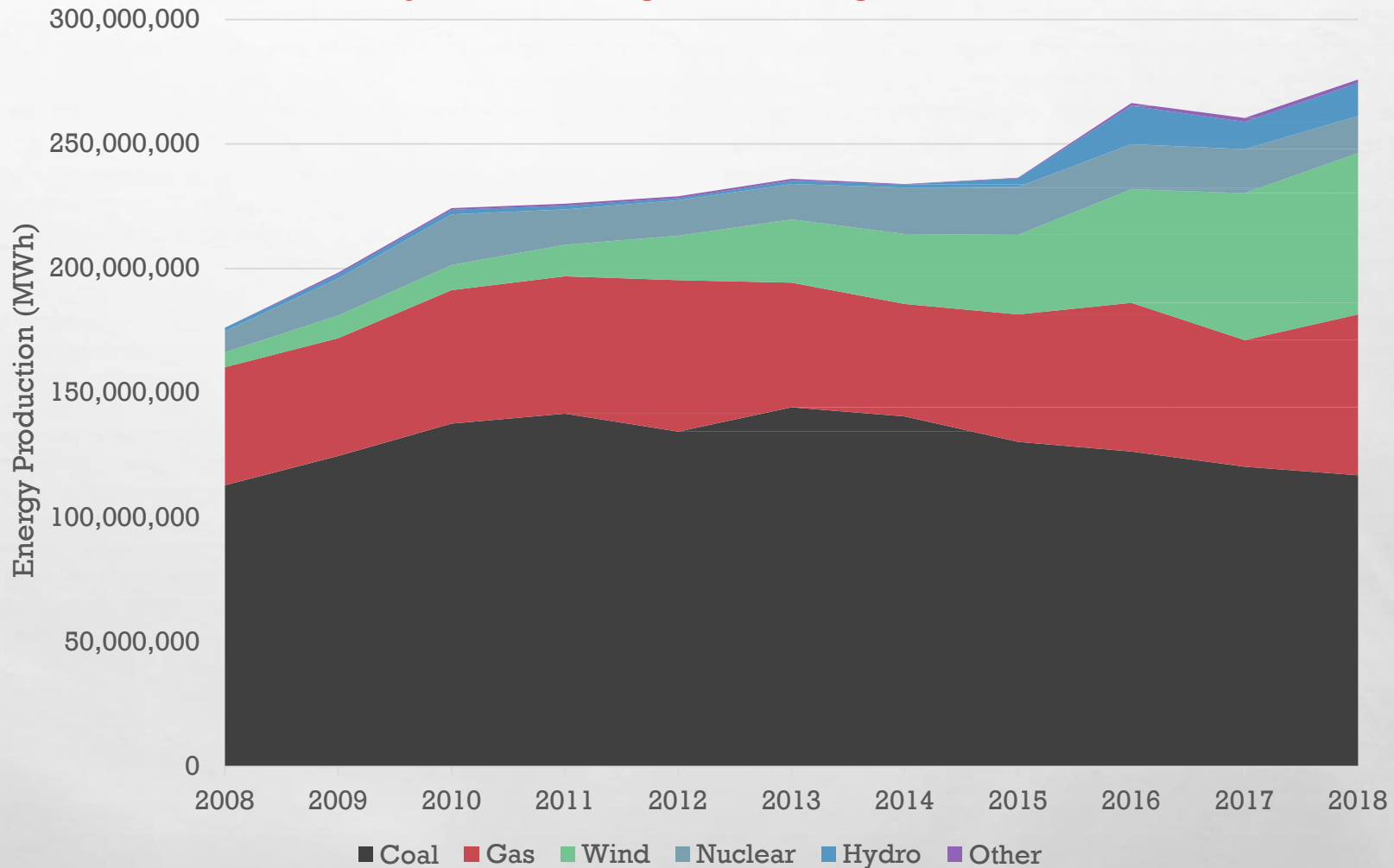
GENERATING CAPACITY BY FUEL MIX OVER TIME



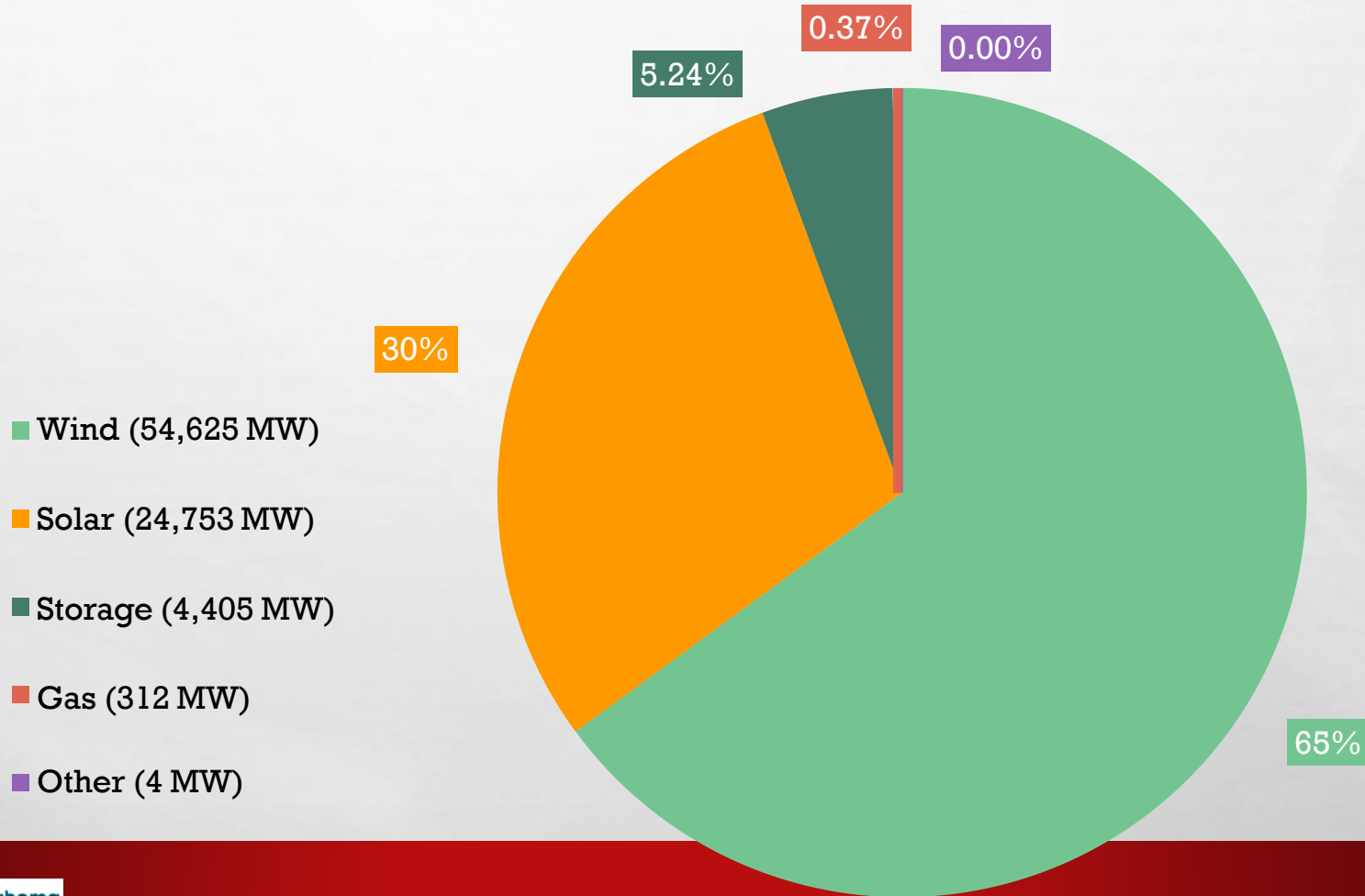
2018 ENERGY PRODUCTION BY FUEL TYPE (275,887 GWH TOTAL)



ENERGY PRODUCTION BY GENERATION TYPE OVER TIME



GENERATOR INTERCONNECTION REQUESTS UNDER STUDY (BY FUEL TYPE): 84,099 MW TOTAL



Generation Type

Wind

Solar

Capacity (MW)

0 - 128

129 - 310

311 - 606

607 - 1290

> 1209

20,220 MW

64,460 MW

Wind and Solar in Generation Interconnection Queue

(aggregated by county)

SPP Southwest
Power Pool

SPP

MARKETS

ELECTRICITY MARKET BASICS

LIKE ANY MARKET, SPP'S ELECTRICITY MARKETS FEATURE:

- **SELLERS/PRODUCERS WITH A PRODUCT AND BUYERS/CONSUMERS WHO WANT TO BUY IT**
- **PRICES THAT ARE DRIVEN BY SUPPLY AND DEMAND**



WHAT KIND OF MARKETS DOES SPP OPERATE?

- **TRANSMISSION SERVICE:** PARTICIPANTS BUY AND SELL USE OF REGIONAL TRANSMISSION LINES THAT ARE OWNED BY DIFFERENT PARTIES.
- **INTEGRATED MARKETPLACE:** PARTICIPANTS BUY AND SELL WHOLESALE ELECTRICITY IN DAY-AHEAD AND REAL-TIME.
- **DAY-AHEAD MARKET:** COMMITS THE MOST COST-EFFECTIVE AND RELIABLE MIX OF GENERATION FOR THE REGION.
- **REAL-TIME BALANCING MARKET:** ECONOMICALLY DISPATCHES GENERATION TO BALANCE REAL-TIME GENERATION AND LOAD, WHILE ENSURING SYSTEM RELIABILITY.

TRANSMISSION MARKET

TRANSMISSION MARKET

- PROVIDES “ONE-STOP SHOPPING” FOR USE OF REGIONAL TRANSMISSION LINES
- CONSISTENT RATES, TERMS, CONDITIONS FOR ALL USERS
- INDEPENDENT
- APPROXIMATELY 7,900 TRANSACTIONS PER MONTH ON AVERAGE IN 2018
- 2018 TRANSMISSION CUSTOMER TRANSACTIONS = \$4.47 BILLION

AS A “SALES AGENT,” SPP ADMINISTERS A TRANSMISSION TARIFF GREATER THAN 6,500 PAGES IN LENGTH ON BEHALF OF ITS MEMBERS AND CUSTOMERS.

HOW TRANSMISSION SERVICE WORKS

- **RESERVING TRANSMISSION SERVICE = RESERVING A SEAT ON A PLANE**
 - **CUSTOMER SPECIFIES PRIORITY, TIME, SOURCE/SINK, CAPACITY**
 - **TARIFF ADMINISTRATOR APPROVES IF CAPACITY EXISTS**
- **ISSUANCE OF NERC TAG = RECEIVING BOARDING PASS**
 - **WON'T BE APPROVED IF IMPROPER USE OF RESERVATION**
- **CREATION OF SCHEDULE FROM TAG = SITTING ON THE PLANE**
 - **GENERATORS RAMP TO PROVIDE ENERGY FOR TRANSACTION**
 - **MAY BE CURTAILED IF TRANSMISSION SYSTEM OVERLOADED**



WHOLESALE ENERGY MARKET

INTEGRATED MARKETPLACE OVERVIEW

Key Components

Day-Ahead (DA) Market

Real-Time Balancing Market
(RTBM)

Transmission Congestion
Rights (TCR) Market

Products

Energy

Operating Reserve
(Regulation Up, Regulation
Down, Spinning,
Supplemental)

Congestion Rights

MARKETPLACE BENEFITS

- **SPP'S MARKETS PROVIDE PARTICIPANTS \$422M IN NET SAVINGS ANNUALLY**
- **REDUCE TOTAL ENERGY COSTS THROUGH CENTRALIZED UNIT COMMITMENT WHILE MAINTAINING RELIABLE OPERATIONS**
- **DAY-AHEAD MARKET ALLOWS ADDITIONAL PRICE ASSURANCE CAPABILITY PRIOR TO REAL-TIME**
- **OPERATING RESERVE PRODUCTS SUPPORT IMPLEMENTATION OF THE SPP BALANCING AUTHORITY AND FACILITATE RESERVE SHARING**

DAY-AHEAD MARKET

- **DETERMINES LEAST-COST SOLUTION TO MEET ENERGY BIDS AND RESERVE REQUIREMENTS**
- **PARTICIPANTS SUBMIT OFFERS AND BIDS TO PURCHASE AND/OR SELL ENERGY AND OPERATING RESERVE:**
 - **ENERGY**
 - **REGULATION-UP**
 - **REGULATION-DOWN**
 - **SPINNING RESERVE**
 - **SUPPLEMENTAL RESERVE**

REAL-TIME BALANCING MARKET (RTBM)



- **BALANCES REAL-TIME LOAD AND GENERATION COMMITTED BY THE DAY-AHEAD MARKET AND RELIABILITY COMMITMENT PROCESSES**
- **OPERATES ON CONTINUOUS 5-MINUTE BASIS**
 - **CALCULATES DISPATCH INSTRUCTIONS FOR ENERGY AND CLEARS OPERATING RESERVE BY RESOURCE**
- **ENERGY AND OPERATING RESERVE ARE CO-OPTIMIZED**
- **SETTLEMENTS BASED ON DIFFERENCE BETWEEN RESULTS OF RTBM PROCESS AND DAY-AHEAD MARKET CLEARING**
- **CHARGES IMPOSED ON MARKET PARTICIPANTS FOR FAILURE TO DEPLOY ENERGY AND OPERATING RESERVE AS INSTRUCTED**

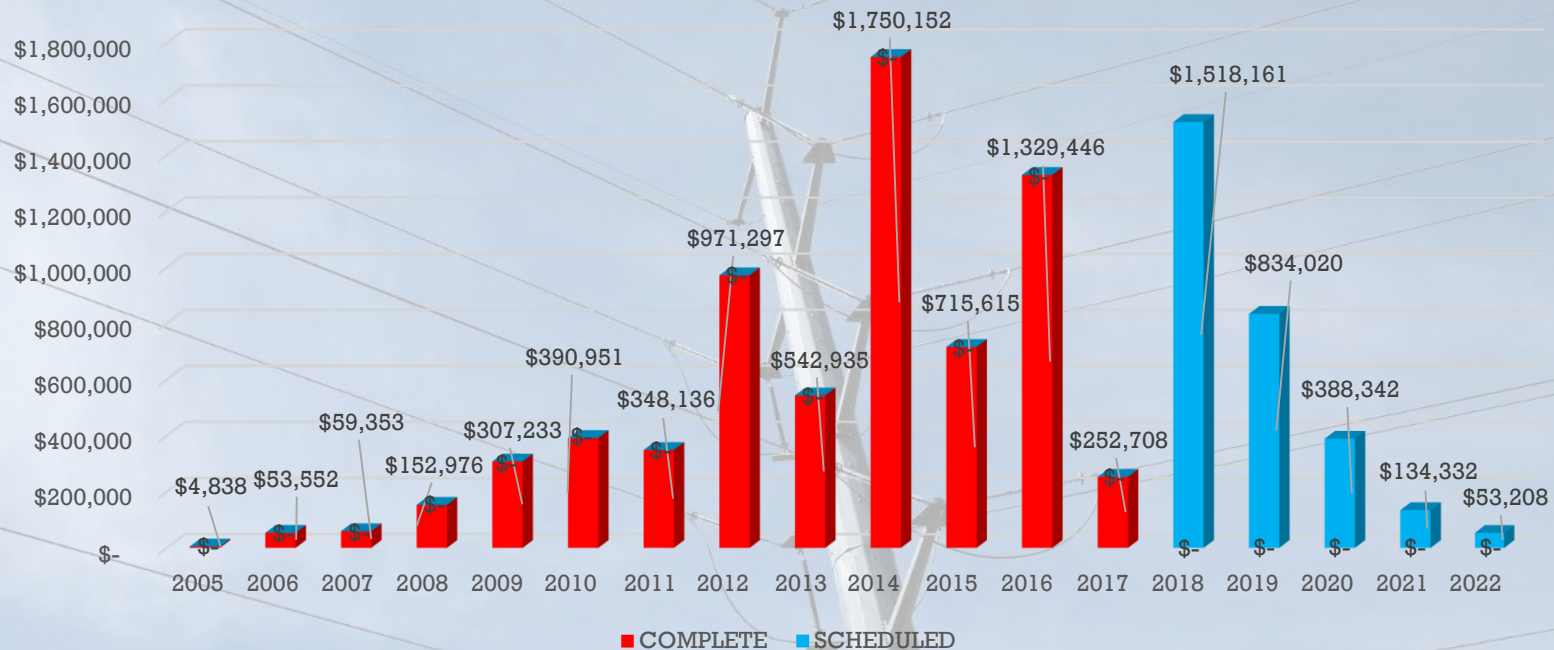
TRANSMISSION PLANNING AT SPP

TRANSMISSION PLANNING CONSIDERATIONS

**MUST TAKE INTO ACCOUNT A NUMBER OF
CONSIDERATIONS, INCLUDING:**

- **RELIABILITY**
- **ECONOMICS**
- **PUBLIC POLICY**

TRANSMISSION INVESTMENT DIRECTED BY SPP



\$6.9B IN COMPLETED PROJECTS
\$3.0B IN SCHEDULED PROJECTS

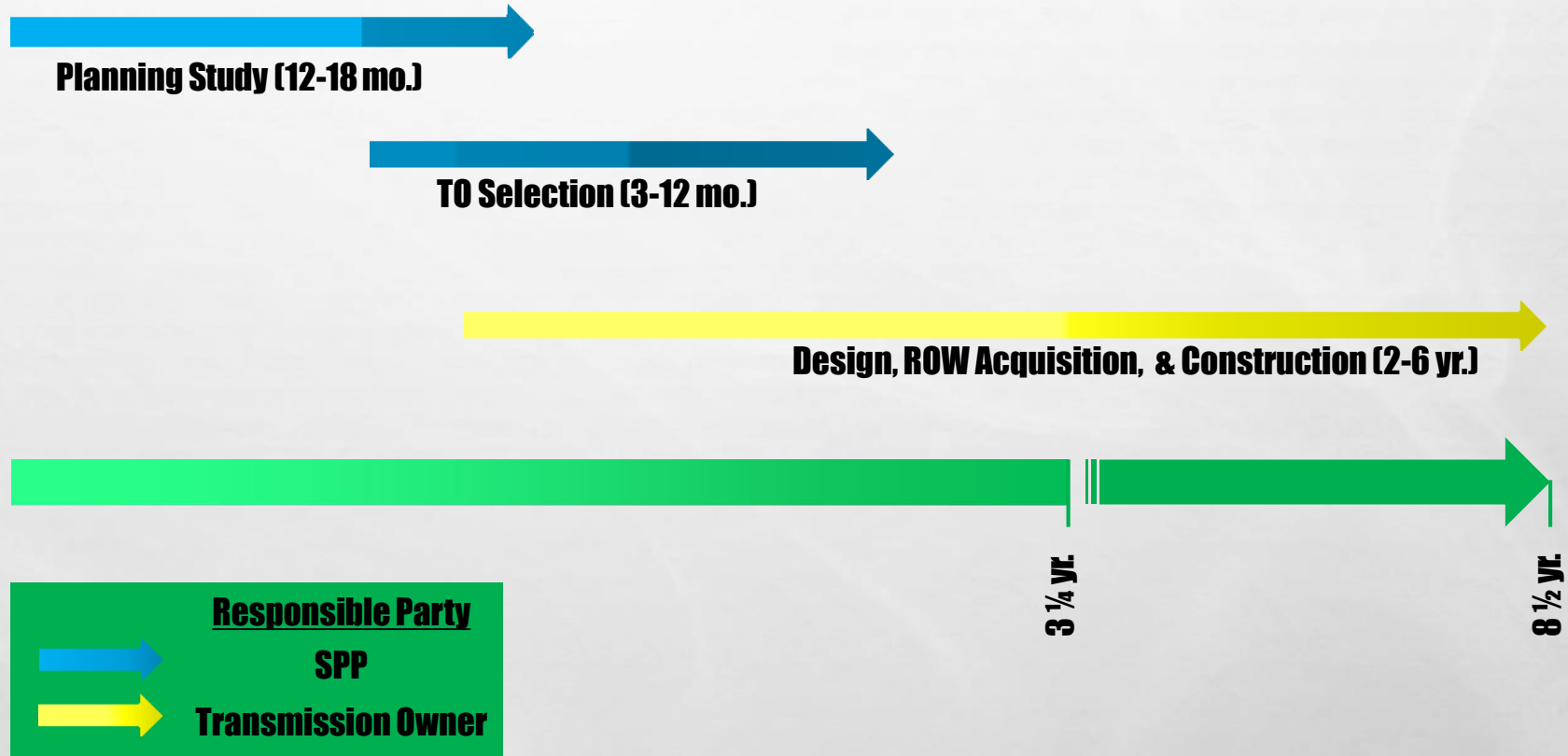
TRANSMISSION IN SPP

- **IN 2018, SPP MEMBERS COMPLETED 36 TRANSMISSION PROJECTS TOTALING MORE THAN \$779 MILLION.**
- **MORE THAN \$10 BILLION IN TRANSMISSION UPGRADES WERE PLANNED AND APPROVED FROM 2004-2018.**
- **66,892 MILES OF TRANSMISSION LINES IN SPP'S FOOTPRINT WOULD CIRCLE THE EARTH MORE THAN TWICE!**
- **SPP'S TRANSMISSION OWNING MEMBERS HAVE APPROXIMATELY \$13.6B IN NET TRANSMISSION INVESTMENT.**

HOW SPP MAKES TRANSMISSION DECISIONS

- **INTEGRATED TRANSMISSION PLANNING PROCESS**
- **GENERATION INTERCONNECTION STUDIES**
 - **DETERMINES TRANSMISSION UPGRADES NEEDED TO CONNECT NEW GENERATION TO ELECTRIC GRID**
- **AGGREGATE TRANSMISSION SERVICE STUDIES**
 - **DETERMINES TRANSMISSION UPGRADES NEEDED TO TRANSMIT ENERGY FROM NEW GENERATION TO LOAD**
 - **SHARES COSTS OF STUDIES AND NEW TRANSMISSION**
- **SPECIFIC TRANSMISSION STUDIES**

TRANSMISSION BUILD CYCLE IN SPP



INTEGRATED TRANSMISSION PLANNING (ITP) PROCESS

- **ANNUAL PLANNING CYCLE ASSESSES NEAR- AND LONG-TERM ECONOMIC AND RELIABILITY NEEDS.**
- **PRODUCES A 10-YEAR TRANSMISSION EXPANSION PLAN EACH YEAR, COMBINING NEAR-TERM, 10-YEAR, AND TPL-001-4 ASSESSMENTS INTO ONE STUDY.**
- **20-YEAR ASSESSMENT PERFORMED NO MORE THAN ONCE EVERY FIVE YEARS EXCEPT WHEN DIRECTED BY THE SPP BOARD OF DIRECTORS.**
- **30 STUDY MODELS ASSESS A VARIETY OF POTENTIAL SCENARIOS.**

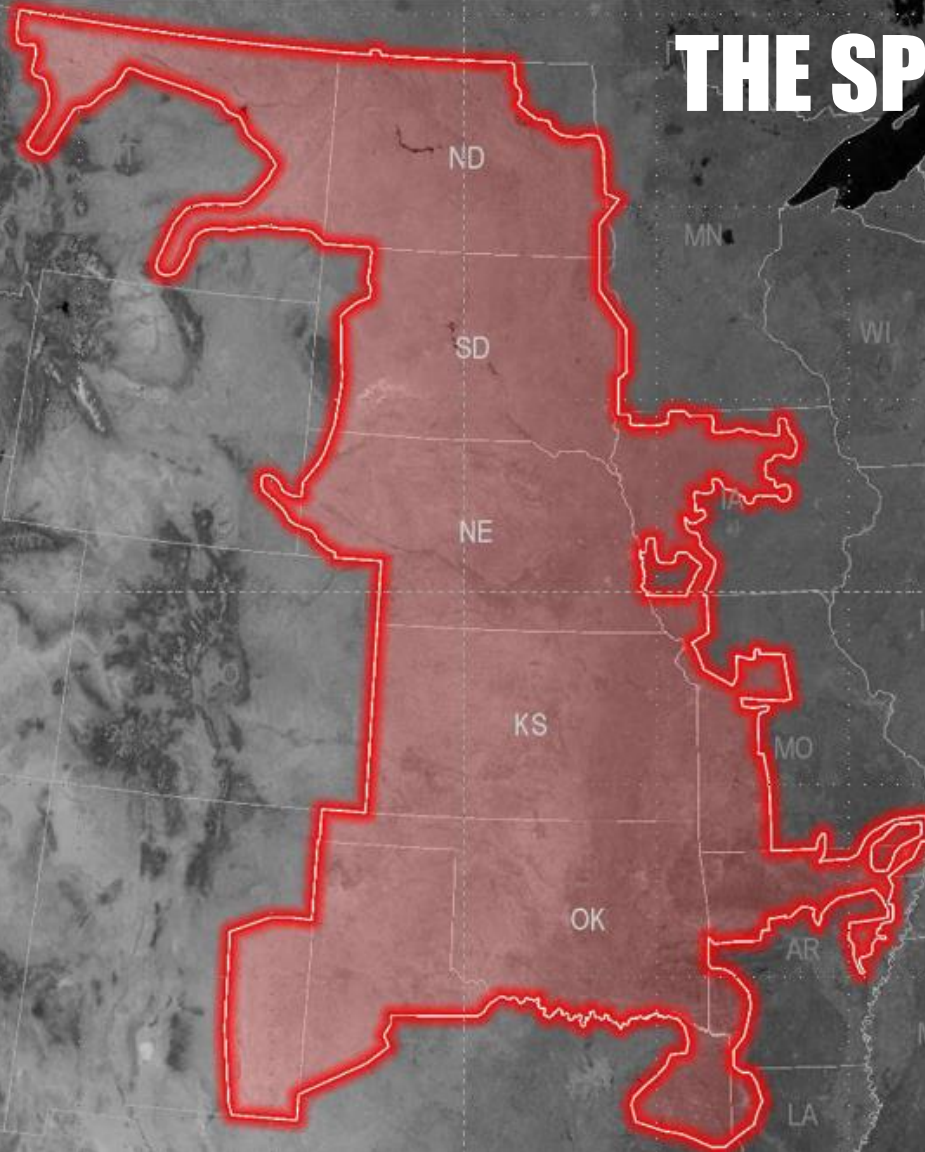
WHO PAYS FOR TRANSMISSION PROJECTS?

- **SPONSORED: PROJECT OWNER BUILDS AND RECEIVES CREDIT FOR USE OF TRANSMISSION LINES**
- **DIRECTLY-ASSIGNED: PROJECT OWNER BUILDS AND IS RESPONSIBLE FOR COST RECOVERY AND RECEIVES CREDIT FOR USE OF TRANSMISSION LINES**
- **HIGHWAY/BYWAY: MOST SPP PROJECTS PAID FOR UNDER THIS METHODOLOGY**

Voltage	Region Pays	Local Zone Pays
300 kV and above	100%	0%
Above 100 kV and below 300 kV	33%	67%
100 kV and below	0%	100%

TRANSMISSION PLANNING MAPS

THE SPP FOOTPRINT



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Date Exported 3/20/2017 1 inch equals 182 miles

Transmission Zones



- | | |
|--|---|
| ■ AEP | ■ OPPD |
| ■ EDE | ■ SPA |
| ■ GMO | ■ SPRM |
| ■ GRDA | ■ SPS |
| ■ INDN | ■ SUNC |
| ■ KCPL | ■ UMZ |
| ■ LES | ■ WESTAR |
| ■ MIDW | ■ MKEC |
| ■ NPPD | ■ WFEC |
| ■ OGE | |

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Projects Constructed or with NTCs

(2005 - 2017)



— 115 kV
— 138 kV
— 161 kV
— 230 kV
— 345 kV



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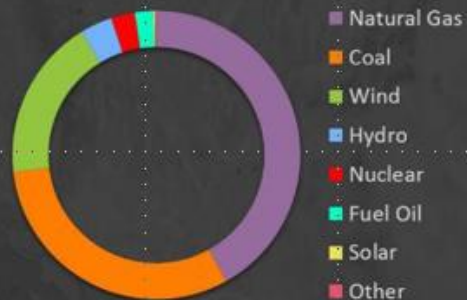
Distribution of Generation

SPP Southwest Power Pool

Capacity (MW)

- 1 - 138
- 139 - 370
- 371 - 730
- 730 - 1334
- > 1334

Generation Mix



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RENEWABLES IN SPP

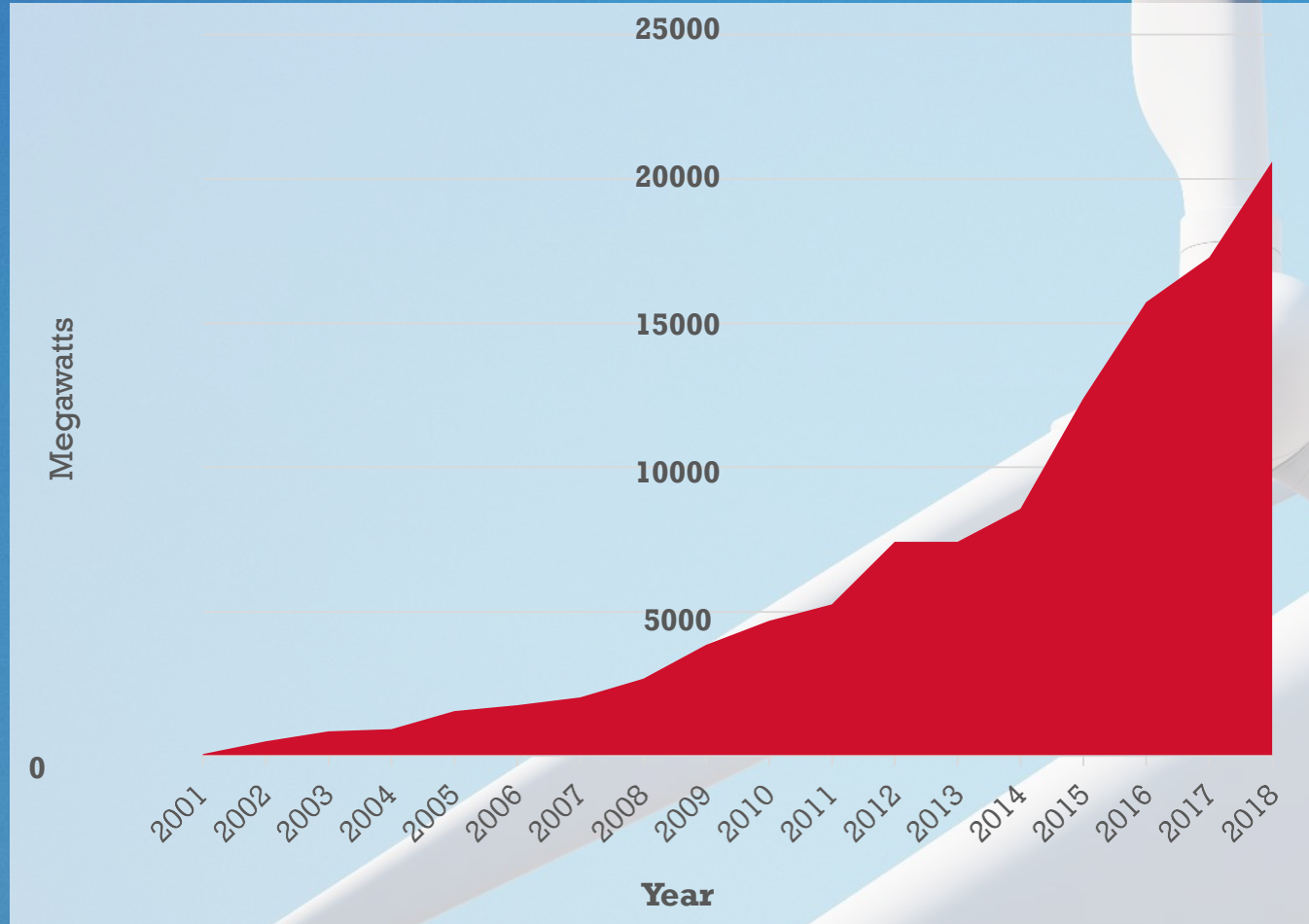
WIND IN SPP'S SYSTEM

- **WIND INSTALLED TODAY: 21,500 MW**
 - **11,100 TURBINES AT 200 WIND RESOURCES (MOST ARE 80M HUB HEIGHT)**
 - **LARGEST WIND RESOURCE: 478 MW (HALE WIND FARM IN HALE COUNTY, TX)**
- **UNBUILT WIND W/SIGNED INTERCONNECTION AGREEMENTS: ~10 GW**
- **WIND IN ALL STAGES OF STUDY AND DEVELOPMENT: ~64 GW**
- **FORECAST WIND INSTALLATION IN 2020: >23 GW (MORE THAN SPP'S CURRENT MINIMUM LOAD)**
- **FORECAST WIND INSTALLATION IN 2025: 28-33 GW**

WIND PENETRATION

- **MAXIMUM WIND OUTPUT: 16,382 MW (12/20/2018)**
- **MINIMUM WIND OUTPUT (LAST 12 MOS.): 147 MW (8/9/18 @ 10:47)**
- **MAXIMUM WIND PENETRATION: 63.96% (4/30/18)**
- **AVERAGE WIND PENETRATION (2018): ~25%**
- **MAX WIND SWING IN ONE DAY: >10 GW (12.5 GW TO 2 GW BACK TO 12 GW)**
- **MAX 1-HOUR RAMP: 3,700 MW**

INSTALLED WIND CAPACITY BY YEAR



Wind Resources Registered In SPP Market



- ≤ 31
- ≤ 74
- ≤ 124
- ≤ 180
- ≤ 400



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SOLAR IN SPP'S SYSTEM

- **SOLAR IN SERVICE: 215 MW**
- **SOLAR IN ALL STAGES OF STUDY AND DEVELOPMENT:
~25 GW**

Solar Resources Registered In SPP Market



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Generation Type

- Wind
- Solar

Capacity (MW)

- 0 - 128
- 129 - 310
- 311 - 606
- 607 - 1290
- > 1209

Wind and Solar in Generation Interconnection Queue

(aggregated by county)

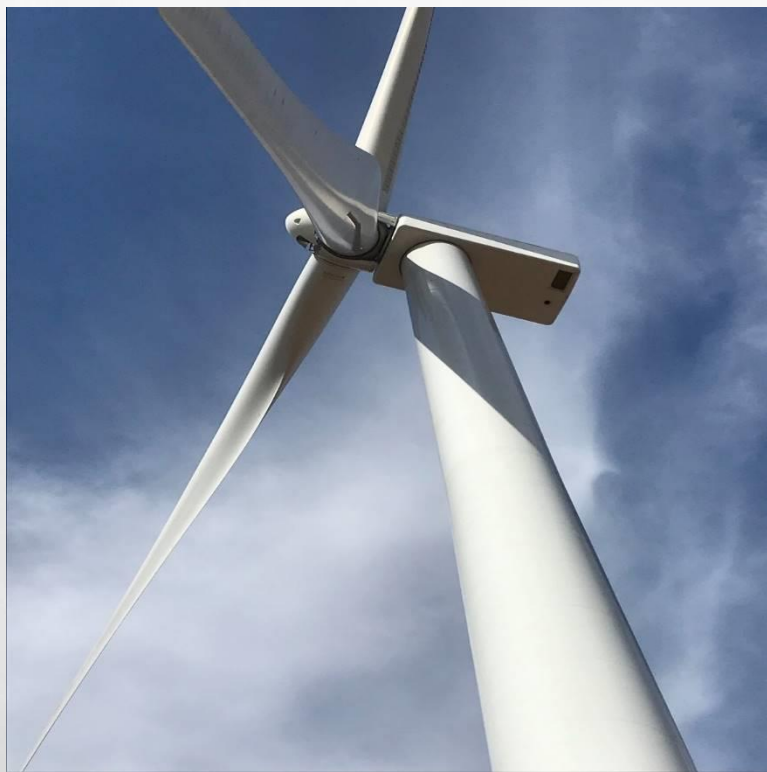


20,220 MW
64,460 MW

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RENEWABLES IN OKLAHOMA

OKLAHOMA WIND FACTS – 2018



- **STATE RANKING FOR INSTALLED CAPACITY: 2ND**
- **NUMBER OF WIND TURBINES: 3,984**
- **INSTALLED WIND CAPACITY (MW): 8,072**
- **WIND PROJECTS ONLINE: 47**
- **WIND IS 31.83% OF OKLAHOMA'S TOTAL ENERGY PRODUCTION**
- **SINCE AUGUST 25, 2016, THE OKLAHOMA CORPORATION COMMISSION HAS RECEIVED 59 NOTICES OF INTENT TO CONSTRUCT A WIND ENERGY FACILITY IN THE STATE**

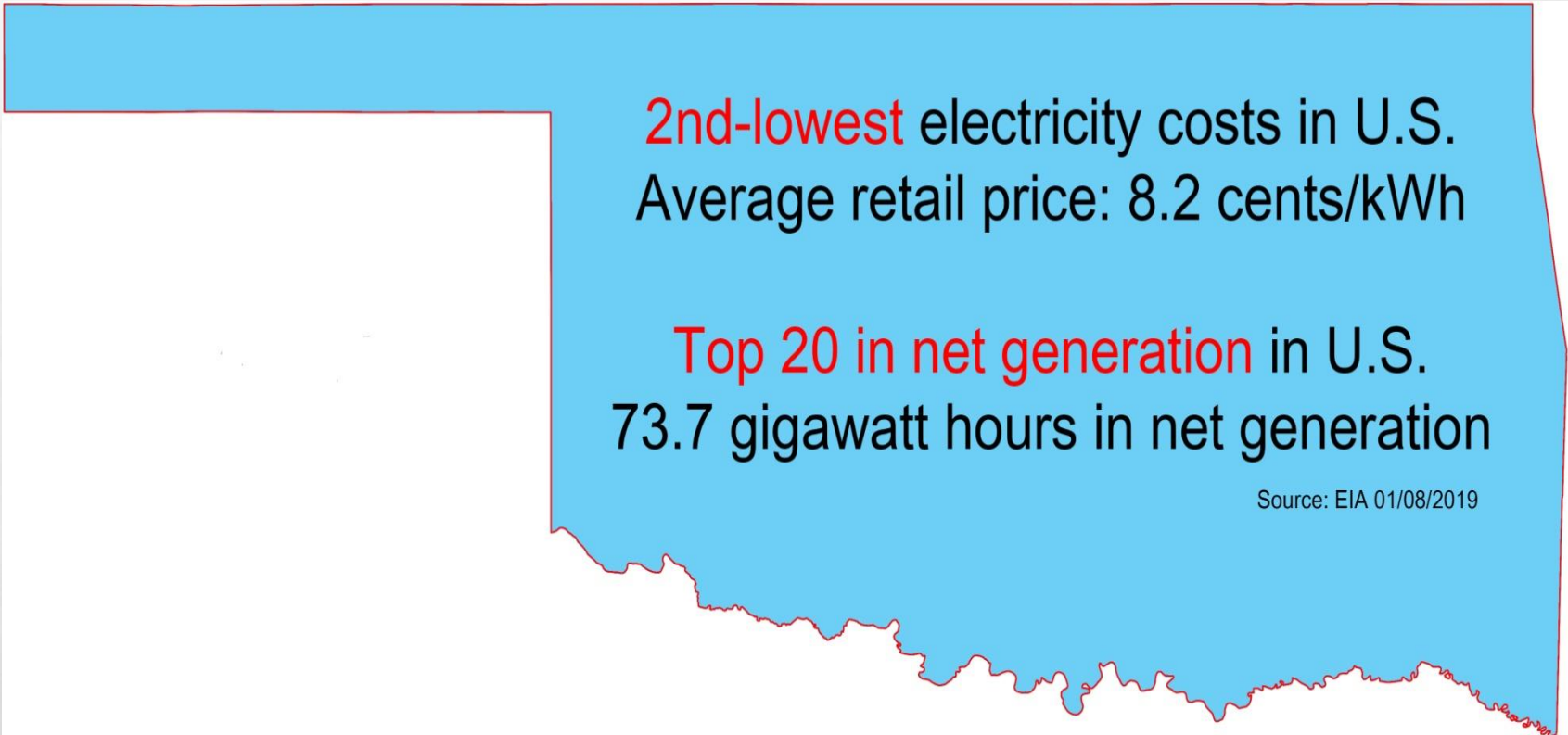
OKLAHOMA SOLAR DATA

SOLAR INSTALLED (MW): 31.2

- **WFEC: 18.0 MW**
- **OGE: 12.5 MW**
- **CEC: 0.5 MW**
- **PSO: 0.3 MW**
- **OEC: 0.2 MW**



LOW-COST, ABUNDANT ELECTRICITY

A light blue map of the state of Oklahoma is shown, with its outline in red. The map is positioned on the left side of the slide, and the text is placed to its right.

2nd-lowest electricity costs in U.S.
Average retail price: 8.2 cents/kWh

Top 20 in net generation in U.S.
73.7 gigawatt hours in net generation

Source: EIA 01/08/2019

QUESTIONS?